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# Automatic Power Conservation Method for Optical Media and The Device Thereof

## BACKGROUND OF THE INVENTION

### 5 1. Field of the Invention:

[0001] The present invention relates to an automatic power conservation method for an optical media and device thereof, and more particularly, to an automatic power conservation method for an optical media and device thereof that is capable of turning off more circuit components while 10 operating in the sleep-mode.

### 2. Description of the Prior Art:

[0002] Energy conservation is a common issue that is being discussed in this era which energy is consumed rapidly. Energy conservation is also an important task while designing an optical media such as CD-ROM, 15 CD-R/RW, DVD-ROM, DVD-R, and DVD-Dual, etc. It is most desirable if the unneeded circuit components of an optical media can all be turned off while it enters the sleep-mode, which it is the main object of the present invention.

[0003] Typically, an optical media will enter the sleep-mode after idling 20 for a period of time. The motor inside the optical media will be stopped to reduce the noise and the heat, and a portion of the circuit components on the circuit board will be turned off as well. However, when entering the sleep-mode, some of the components on the circuit board are still functioning, which include the host inference (HI) of the integrated circuit 25 (IC), Random Access Memory Arbiter (RAM Arbiter), Micro-Computing Unit (MCU), and Dynamic RAM (DRAM).

[0004] Please refer to Fig. 1, which is a block diagram of the circuitry between the PC and the IC of a conventional optical media. As the optical media enters the sleep-mode, the PC, or the Host 150 will send some signals 30 to the HI 120 of the IC 100 in the optical media. Based on the signal received by the HI 120 from the Host 150, the MCU 110 of the IC 100 will send the information of the current operating mode of the optical media to

the Host 150 through the HI 120 in response.

[0005] The optical media can leave the sleep-mode by requesting from the user through the Host 150, or through the panel of the optical media (which is not shown in the figure). However, the user wakes the optical media up from the sleep-mode either through the Host 150 or the panel, the control signal needs to be sent from the HI 120 to the MCU 110 so that the MCU 110 can ask the optical media to leave the sleep-mode. Moreover, while processing these signals, the MCU 110 needs to access the DRAM 140 outside the IC 100 through the RAM Arbiter 130.

[0006] Therefore, while the foregoing conventional mechanism for optical media is in the sleep-mode, the HI 120, the MCU 110, the RAM Arbiter 130, and the DRAM 140 of the optical media are, instead of in the sleep-mode, still processing. If these circuit components can as well enter the sleep-mode as the optical media entering the same, the power can be conserved.

[0007] In view of this, the present invention provides an automatic power conservation method for optical media to conserve more power by turning off more circuit components when the optical media enters the sleep-mode.

## 20 SUMMARY OF THE INVENTION

[0008] The primary object of the present invention is to provide an automatic power conservation method for optical media that, when the optical media enters the sleep-mode, the HI of the optical media will turn off other circuit components that are still in operation and thereafter the HI is also being used for issuing a response to an external signal received by the optical media. If the external signal requests the optical media to leave the sleep-mode, the HI will wake up those circuit components that are turned off by the same.

[0009] In the preferred embodiment of the present invention, the HI will first turn off the MCU in the IC, and then the other circuit components that are still in operation will be turned off thereafter. That is, the HI will successively turn off the MCU off first, then the RAM Arbiter and the DRAM.

[0010] On the contrary, the HI will wake up some of those circuit components before the MCU is being wakened up. In other words, the HI will successively wake up the RAM Arbiter, the DRAM, and finally the MCU.

5 [0011] However, as the optical media enters the sleep-mode, the HI will response to external signals received by the optical media, such as signals transmitted from the host of a PC or the input panel of the optical media.

10 [0012] The other object of the present invention is to provide an automatic power conservation device for optical media that the host inference of the optical media possesses the firmware capable of responding to an external signal.

15 [0013] To sum up, the present invention provides an automatic power conservation method for optical media and the receiving method thereof that is capable of conserving more energy by turning off more circuit components when entering the sleep-mode.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0014] FIG. 1 is a block diagram of the circuitry between the PC and the IC of a conventional optical media.

20 [0015] FIG. 2 is a flowchart depicting an automatic power conservation method for optical media according to a preferred embodiment of the present invention.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

25 [0016] In order to turn off more circuit components when the optical media enters the sleep-mode, such as the MCU and the RAM Arbiter inside the IC or the DRAM outside the IC, the present invention utilizes the HI in the IC of the optical media to response to the external signal directly when in the sleep-mode, instead of responding by the MCU. Therefore, if the 30 optical media can operate using this mechanism (AUTOACK) when entering the sleep-mode, the MCU and the related circuit components

posterior to the MCU surely can be turned off so that the power conservation can be achieved when the optical media enters the sleep-mode.

[0017] To further describe the objects and features of the present invention, drawings and detailed description of the preferred embodiment  
5 are presented.

[0018] Please refer to Fig. 2, which is a flowchart depicting an automatic power conservation method for optical media according to a preferred embodiment of the present invention. Before entering the sleep mode when the optical media is on, the optical media is in a normal mode as  
10 seen in Step 201. In step 202, After the optical media enters the sleep-mode, the HI inside the IC of the optical media will make an evaluation depending on the idling time of the optical media to determine whether to execute the power conservation function, or AUTOACK, by the the firmware embedded therein.

15 [0019] As the optical media had entered the sleep-mode and had idled for a period of time, the HI will execute the AUTOACK and turn off the circuit components that are still in operation, such as the MCU and the RAM Arbiter in the IC, and the DRAM outside the IC. In the preferred embodiment of the present invention, the HI will turn off the MCU first in  
20 considering that the MCU consumes most of the power as seen in step 203. In step 204, after turning off the MCU, the HI will then turn off other circuit components that are in operation, such as the RAM Arbiter and the DRAM.

25 [0020] If the optical media haven't been idled for a certain period of time after the optical media enters the sleep-mode, the HI will not execute the AUTOACK function and the optical media will be in the normal mode, which is represented by step 202 to 201.

[0021] On the contrary, after HI executes the AUTOACK function and turns off the circuit components that are still in operation as the optical media entered the sleep-mode, the HI plays the role of the MCU in the  
30 sleep-mode of a conventional optical media, that the HI will response to the external signals sent from the host of the optical media, or the PC, such as the Test Unity Ready and the Request Sense signals from the PC through the ATAPI interface of the optical media. Assuming the signal sent from the PC to the HI is the Request Sense ATAPI command, the HI will decode the

same automatically for determining the transferring mode (PIO/DMA/UDMA) and the amount of data to be transferred, and then transfers a table data to the host so that the host knows the error code of the optical media, and a interrupt signal is being issued automatically by the HI  
5 after the transferring so that the optical media can still remain in the sleep-mode, which is represented by Steps 205 to 204.

[0022] However, if the ATAPI signal from the host is neither the Test Unity Ready nor the Request Sense, or if the play or the eject button on the optical media's panel is being pressed by the user, the HI will first wake up  
10 the RAM Arbiter and the DRAM, which is represented by Steps 205 to 206. The HI will then wake up the MCU thereafter, which is represented by Steps 206 to 207.

[0023] Therefore, by utilizing the AUTOACK function, the optical media can turn off the circuit components, such as the MCU, the RAM  
15 Arbiter, and the DRAM, that are still in operation in a convention optical media when the optical media enters the sleep-mode, such that the power consumption can be reduced efficiently. According to the experiments, the power consumption of the optical media without using the AUTOACK function is 120 mA, while the consumption is significantly reduced to 90 ~  
20 100 mA when the AUTOACK function is on.

[0024] In summary, the present invention provides an automatic power conservation method for optical media and device thereof, which is capable of conserving more power by turning off more circuit components when entering the sleep-mode and is realized by the firmware programmed in the  
25 HI so that the HI can response to the host of the optical media.

[0025] While the preferred embodiment of the invention has been set forth for the purpose of disclosure, modifications of the disclosed embodiment of the invention as well as other embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are  
30 intended to cover all embodiments which do not depart from the spirit and scope of the invention.